

# **PLANT SCIENCE**

## **Curriculum Content Framework**

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# Curriculum Content Framework

## PLANT SCIENCE

**Grade Levels: 10, 11, 12**  
**Course Code: 491032**

**Prerequisites: Agriculture Science & Technology or Agriculture Science**

Course Description: This course covers the relationship between plants and people, plant morphology and physiology, plant production, the environment, soil, and other related areas.

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# Unit 1: Introduction to Plant Science

## 5 Hours

Terminology: CDE, Cultivar, Entrepreneur, Genus, Plant science, Proficiency Award, SAE, Species, Variety

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
Define terminology		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6]
1.1 Explain the importance of plants in our daily lives		Foundation	Speaking	Participates in conversation, discussion, and group presentations [1.5.8]
		Thinking	Creative Thinking	Combines ideas or information in new way [4.1.2]  Makes connections between seemingly unrelated ideas [4.1.6]
1.2 Discuss the significance of the binomial system of naming plants		Foundation	Science	Describes/Explains scientific principles related to plant science [1.4.14]
		Personal Management	Responsibility	Exerts a high level of effort and perseverance toward goal attainment [3.4.4]

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
1.3 Identify careers in plant science	1.4.1 Research a career in plant science to determine educational requirements, working conditions, and salary	Foundation	Reading	Applies information to job performance [1.3.4]  Uses standard occupational resource materials [1.3.22]
		Personal Management	Career Awareness, Development, & Mobility	Develops skills to locate, evaluate, and interpret career information [3.1.4]
1.4 List the three broad areas of plant science		Foundation	Speaking	Speaks in a clear, concise manner [1.5.12]
		Thinking	Creative thinking	Makes connections between seemingly unrelated ideas [4.1.6]
1.5 Discuss FFA opportunities available for students interested in plant science	1.6.1 Demonstrate knowledge by attending Career Development Events	Foundation	Listening	Listens for content [1.2.3]
		Interpersonal	Teamwork	Comprehends ideas and concepts related to FFA opportunities in plant science [2.6.1]

## Unit 2: Plant Anatomy

### 15 Hours

Terminology: Annual, Apical dominance, Biennial, Chloroplasts, Cotyledon, Dicot, Guard cells, Internode, Lateral bud, Leaf, Leaf blade, Monocot, Node, Perennial, Petiole, Photosynthesis, Phloem, Respiration, Root, Stoma, Terminal bud, Transpiration, Xylem

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
2.1 Define terminology		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6]
2.2 Outline functions of the four major plant parts		Foundation	Science	Acquires and processes scientific data [1.4.1]
		Thinking	Knowing how to Learn	Uses available resources to acquire new skills or improve skills [4.3.4]
2.3 List the two leaf types		Foundation	Science	Applies knowledge to complete a practical task [1.4.3]
		Thinking	Creative Thinking	Develops visual aids to create audience interest [4.1.4]
2.4 List the function of the stoma		Foundation	Science	Applies scientific principles related to plant science [1.4.5]
		Thinking	Seeing Things in the Mind's Eye	Visualizes a system's operation from schematics [4.6.3]
2.5 Explain the function of the guard cells		Foundation	Reading	Comprehends written information for main ideas [1.3.7]
		Thinking	Reasoning	Sees relationship between two or more ideas, objects, or situations [4.5.5]

<b>CAREER AND TECHNICAL SKILLS</b> What the Student Should Be Able to Do		<b>ACADEMIC AND WORKPLACE SKILLS</b> What the Instruction Should Reinforce		
<b>Knowledge</b>	<b>Application</b>	<b>Skill Group</b>	<b>Skill</b>	<b>Description</b>
2.6 Review the function of the chloroplasts	2.6.1 View stomata, guard cells, and chloroplasts under a microscope	Foundation	Science	Chooses appropriately from a variety of scientific methods and techniques to complete a task [1.4.9]
		Thinking	Reasoning	Uses logic to draw conclusions from available information [4.5.6]
2.7 Examine respiration, transpiration, and photosynthesis	2.7.1 Diagram the chemical equation for photosynthesis	Foundation	Reading	Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
		Personal Management	Responsibility	Maintains a high level of concentration in completion of a task [3.4.7]
2.8 Explain the function of the phloem and xylem	2.8.1 Observe phloem and xylem cells under a microscope	Foundation	Science	Describes/Explains scientific principles related to plant systems [1.4.14]
		Interpersonal	Teamwork	Recognizes effects of positive/negative attitudes on coworkers [2.6.4]
2.9 Explain the difference between a monocot and dicot	2.9.1 Observe monocot and dicot stems under a microscope	Foundation	Writing	Analyzes data, summarizes results, and make conclusions [1.6.2]
		Thinking	Reasoning	Determines which conclusions are correct when given a set of facts and a set of conclusions [4.5.3]
2.10 List the two root systems		Foundation	Reading	Determines what information is needed [1.3.10]
		Thinking	Knowing how to Learn	Uses available resources to acquire new skills or improve skills [4.3.4]
2.11 Discuss the function of root hairs		Foundation	Speaking	Applies/Uses technical terms as appropriate to audience [1.5.2]
		Thinking	Reasoning	Uses logic to draw conclusions from available information [4.5.6]

<b>CAREER AND TECHNICAL SKILLS</b> What the Student Should Be Able to Do		<b>ACADEMIC AND WORKPLACE SKILLS</b> What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
2.12 Distinguish between annual, biennial, and perennial plants		Foundation	Speaking	Applies/Uses technical terms as appropriate to audience [1.5.2]
		Thinking	Reasoning	Uses logic to draw conclusions from available information [4.5.6]

## Unit 3: Soil Science & Fertility

### 15 Hours

**Terminology:** Capillary water, Clay, Elements, Fertilizer, Fertilizer analysis, Free water, Gravitational water, Hygroscopic water, Lime, Macronutrient, Micronutrient, Organic matter, pH, Pore space, Sand, Silt, Soil fertility, Soil profile, Soil sterilization, Soil structure, Soil texture, Subsoil, Topsoil

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
3.1 Define terminology		Foundation	Reading	Applies/understands technical words that pertain to subject [1.3.6]
3.2 Differentiate between soil structure and soil texture	3.2.1 Determine the texture of soil samples using the "Soil Textural Triangle"	Thinking	Seeing Things in the Mind's Eye	Organizes and processes images—symbols, pictures, graphs, objects, etc. [4.6.1]
3.3 Identify the three soil particles		Knowledge	Reading	Identifies relevant details, facts, and specifications [1.3.16]
3.4 Explain the importance of soil sterilization	3.4.1 Sterilize soil for use	Foundation	Reading	Comprehends written information, and applies it to a task [1.3.8]
		Personal Management	Integrity/Honesty/Work Ethic	Follows established rules, regulations, and policies [3.2.5]
Identify the six macronutrients necessary for plant growth		Foundation	Science	Describes/Explains scientific principles related to plant nutrition [1.4.14]
		Thinking	Reasoning	Sees relationship between two or more ideas, objects, or situations [4.5.5]
3.5 List the three types of water found in the soil		Foundation	Reading	Comprehends written information for main task [1.3.7]



<b>CAREER AND TECHNICAL SKILLS</b> What the Student Should Be Able to Do		<b>ACADEMIC AND WORKPLACE SKILLS</b> What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
3.6 Explain fertilizer analysis	3.7.1 Study labels from various types of fertilizers to determine content	Foundation	Reading	Uses appropriate materials and techniques as specified [1.3.20]
		Thinking	Knowing how to Learn	Processes new information as related to workplace [4.3.5]
3.7 Explain the use of soil pH in soil fertility		Thinking	Problem Solving	Draws conclusion from observations, evaluates conditions, and gives possible solutions [4.4.5]

## Unit 4: Plant Growth Systems

### 10 Hours

Terminology: Cell, Internode, Node, Photoperiodism, Rooting hormone, Stimulant

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
Define terminology		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6]
4.1 Explain the use of rooting hormones on cuttings	4.2.1 Treat several cuttings with different hormones	Foundation	Science	Performs experiment as specified [1.4.20]
		Personal Management	Integrity/Honesty/Work Ethic	Complies with safety and health rules in a given work environment [3.2.2]
4.2 Differentiate between nodes and internodes		Foundation	Reading	Identifies relevant details, facts, and specifications [1.3.16]
		Thinking	Decision Making	Demonstrates decision-making skills [4.2.4]
4.3 Describe how chemical stimulants are used		Foundation	Science	Acquires and processes scientific data [1.4.1]
			Speaking	Organizes ideas and communicates oral messages to listeners [1.5.7]
4.4 Distinguish between short, long, and day neutral plants		Foundation	Writing	Analyzes data, summarizes results, and makes conclusions [1.6.2]
		Thinking	Reasoning	Uses logic to draw conclusions from available information [4.5.6]

## Unit 5: Sexual Propagation 10 Hours

Terminology: Fertilization, Germination, Hybrid, Ovary, Ovule, Pollen, Pollination, Scarification, Seed, Stigma, Stratification,

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
5.1 Define terminology		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6]
5.2 List advantages and disadvantages of growing plants from seed		Foundation	Reading	Applies information and concepts derived from printed materials [1.3.3]
		Thinking	Decision Making	Evaluates information/data to make best decision [4.2.5]
5.3 Describe optimum for seed germination	5.3.1 Germinate seeds	Foundation	Speaking	Communicates a thought, idea, or fact in spoken form [1.5.5]
		Interpersonal	Teamwork	Contributes to group with ideas, suggestions, and effort [2.6.2]

## Unit 6: Asexual Propagation 20 Hours

Terminology: Clone, Cutting, Division, Grafting, Layering, Scion, Separation, Tissue culture

CAREER AND TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC AND WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
6.1 Define terminology		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6]
6.2 Explain how cuttings are taken	6.2.1 Demonstrate the procedure for taking cuttings	Foundation	Listening	Listens to follow directions [1.2.6]
		Thinking	Problem Solving	Draws conclusions from observations, evaluates conditions, and gives possible solutions [4.4.5]
6.3 Describe tissue culture	6.3.1 Perform a tissue culture	Foundation	Reading	Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Science	Observes health code/sanitation requirements [1.4.19]
6.4 Explain how budding is different from grafting	6.4.1 Demonstrate the steps involved in budding	Foundation	Reading	Comprehends written specifications and applies them to a task [1.3.9]
	6.4.2 Demonstrate the steps involved in grafting	Thinking	Reasoning	Applies rules and principles to a new situation [4.5.1]
6.5 Explain the difference between separation and division	6.5.1 Demonstrate the steps involved in separation	Foundation	Science	Solves practical problems using scientific methods and techniques [1.4.23]
	6.5.2 Demonstrate the steps involved in division	Personal Management	Responsibility	Exerts a high level of effort and perseverance toward goal attainment [3.4.4]

# Glossary

## Unit 1: Introduction to Plant Science

CDE—Career Development Event

1. Cultivar—a cultivated plant that has specific and distinguishable characteristics
2. Entrepreneur—one who works for oneself
3. Genus—a closely related and definable group of plants comprising of one or more species
4. Plant science—the study of the structure, functions, growth, and protection of plants; usually includes three areas: field crops, horticultural crops, and forestry
5. Proficiency Award—an award for an individual's SAE
6. SAE—Supervised Agricultural Experience
7. Species—the basic unit in the classification system whose members have similar structure, common ancestors, and maintain their characteristics; subgroup of genus
8. Variety—a subdivision of a species; it has various inheritable characteristics of form and structure that are continued through both sexual and asexual propagation

## Unit 2: Plant Systems

1. Annual—a plant that completes its life cycle in one growing season
2. Apical dominance—a condition created by hormones in the apical meristem that prevents lateral buds from developing
3. Biennial—a plant that completes its life cycle in two growing seasons
4. Chloroplasts—the part of a plant cell containing green pigment to trap light energy for photosynthesis
5. Cotyledon—seed leaves on an embryo
6. Dicot—a class of flowering plants where two cotyledons are found
7. Guard cells—a pair of cells that regulates the opening and closing of the stomata
8. Internode—the area between two nodes
9. Lateral bud—a bud located along the sides of stems where the leaves are attached
10. Leaf—a plant part consisting of a stipule, petiole, and blade
11. Leaf blade—the large broad part of the leaf
12. Monocot—a class of flowering plants where two cotyledons are found
13. Node—the portion of the stem that is swollen or slightly enlarged that gives rise to buds
14. Perennial—a plant with a life cycle of more than two years
15. Petiole—the leaf stalk; the connecting structure between the leaf blade and plant stem
16. Photosynthesis—the process by which green plants convert solar energy into stored chemical energy
17. Phloem—the plant tissue that transports food made in the leaves down to the roots for storage
18. Respiration—the process by which plants take in oxygen and give off carbon dioxide
19. Root—the underground part of the plant that stores food and absorbs moisture and minerals from the ground

- 20. Stoma—an opening or pore in the leaf that allows for the exchange of oxygen, carbon dioxide, and water vapor (stomata—pl)
- 21. Terminal bud—the large bud at the tip of a twig
- 22. Transpiration—the movement of water vapor through a stoma out of a plant
- 23. Xylem—the plant tissue that transports food, moisture, and nutrients up from the roots

## Unit 3: Soil Science & Fertility

1. Capillary water—water held between soil particles against the force of gravity
2. Clay—the smallest of inorganic particles in the soil
3. Elements—the most basic form of matter that maintains the characteristics of the substance
4. Fertilizer—any material added to the soil to provide nutrients
5. Fertilizer analysis—percentage of nutrients in fertilizer
6. Free water—water that drains out of the soil after it has been wetted
7. Gravitational water—water pulled downward in the soil by gravity
8. Hygroscopic water—water that forms a thin film around soil particles and is not available to plants
9. Lime—a substance that is added to soil; used to raise pH
10. Macronutrient—the nutrients needed by plants in the largest amounts, such as nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur
11. Micronutrient—the nutrients needed by plants in small amounts, such as boron, copper, chlorine, iron, manganese, molybdenum, nickel, and zinc
12. Organic matter—decayed or partially decayed remains of plants and animals found in the soil
13. pH—the measure of acidity or alkalinity of the soil
14. Pore space—space between soil particles
15. Sand—the largest of the soil particles
16. Silt—the middle sized of the soil particles
17. Soil fertility—the ability of soil to provide nutrients for plant growth
18. Soil profile—a cross section of the soil, usually three to four feet deep



19. Soil sterilization—the process of preventing growth of plants in a soil
20. Soil structure—the way soil particles are arranged
21. Soil texture—the amount of sand, silt and clay
22. Subsoil—the layer of soil below the topsoil
23. Topsoil—the layer of soil found on the surface

## Unit 4: Plant Growth Systems

1. Cell—the basic unit of life, containing living material bound by a membrane
2. Internode—the area between two nodes
3. Node—the portion of the stem that is swollen or slightly enlarged that gives rise to buds
4. Photoperiodism—the response of plants to light
5. Rooting hormone—a hormone used to enhance production of roots on a cutting
6. Stimulant—a substance applied that will accelerate an organic response

## Unit 5: Sexual Propagation

1. Fertilization—the process in which the sperm cell joins the egg cell
2. Germination—growth of a new plant from a seed
3. Hybrid—offspring from genetically different parents; produced through human manipulation
4. Ovary—the part of the flower that contains one or more ovules
5. Ovule—the part of the ovary where eggs are produced and seeds develop
6. Pollen—the part of the flower that produces male sex cells
7. Pollination—the transfer of pollen from the male to female part of the flower
8. Scarification—the breaking down of a seed coat to encourage germination
9. Seed—the fertilized, mature ovule of a plant; consists of three major parts: seed coat, embryo, and stored food
10. Stigma—the sticky part of a flower pistil where pollen is collected
11. Stratification—the process of a seed going through a time of cold temperature before it germinates

## Unit 6: Asexual Propagation

1. Clone—a genetic duplicate of a parent
2. Cutting—stems, leaves, or roots of plants used for asexual reproduction
3. Division—the cutting of new plants into sections for growing new plants
4. Grafting—the process of getting the parts of one plant to grow on the parts of another plant; scion from one plant is placed on the stock of another plant
5. Layering—the method of asexual reproduction in which stems form a root while the stem is attached to the parent plant
6. Scion—the stem or bud portion of a graft
7. Separation—a propagation method in which natural plant structures are removed from the parent plant and grown separately
8. Tissue culture—reproducing a plant by using small pieces of tissue in an artificial medium under sterile conditions